THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[FIFTH SERIES.]

No. 116. AUGUST 1887.

VII.—*Bryozoa from New South Wales, North Australia, &c.*

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[Plate IV.]

Part I.

The collection now described was kindly sent to me by Mr. Brazier, of Sydney, who had dredged the specimens himself and carefully noted the localities and depths, thus greatly increasing its value. The New South Wales collection was recently received; but to this I have added some dredged near New Guinea, which Mr. Brazier gave me a few years ago, and I have also mentioned a few New South Wales specimens sent to me by friends.

My work has for a long time been mostly with fossil* Bryozoa from Australia and New Zealand, and it has been necessary to make constant comparisons with recent ones, so that, although publishing in geological periodicals, I have added many new localities for recent forms, and also pointed out many cases of fossil species still being found living; and it is to be hoped that those communications may be useful to

* Quart. Journ. Geol. Soc. vol. xxxvii. p. 309, vol. xxxviii. pp. 257 and 502, vol. xxxix. p. 423, vol. xl. p. 674, vol. xli. p. 279, vol. xliii. p. 40.

students interested in geographical distribution, a point with which I again deal fully.

Another point to which I was obliged to devote special attention was the indications given by palæontology as to the relative value of various characters, and this again could not be done by questioning fossils alone; but recent forms were also examined. This has naturally made me a warm supporter of those who saw that the mode of growth and zoarial characters generally must, in importance, be placed after the zoœcial. Of the zoœcial characters the shape of the oral aperture is the most useful, and this, I have pointed out *, can best be studied by means of the opercula; and both Busk and MacGillivray, and myself have shown that the avicularian mandibles furnish characters of the greatest value specifically. My own collection of these chitinous elements represents many hundred species, and their importance can scarcely be overrated, for in many cases there are minute characters which are distinctly of specific value, but unless the opercula or mandibles are carefully separated out some of the most important points will not be noticed. It was quite incomprehensible how Mr. Busk had overlooked so many details in his 'Challenger' work, until I saw some collections illustrating these chitinous elements, which he presented to the British Museum, and then it became quite clear that mounting them in mass, surrounded by the integumentary tissues, accounted for his not having seen many things of importance.

It is of course very tedious teasing out these covers under the microscope; but for fresh descriptions or doubtful cases it should, if possible, be done; also calcined preparations of a portion of the zoarium should be made to show the calcareous structure, and decalcified pieces should also be mounted. This can best be done in glycerine jelly, the air being removed after decalcification by prolonged soaking in spirit, and then the specimen must be transferred to a mixture of glycerine and spirit, and thus gradually into pure glycerine. Such genera as *Catenicella* should be thus studied.

There are only five species of *Catenicella* in these collections, and they have been a good deal knocked about by the waves. The opercula of this genus have so far not received any attention, nor in this family are they likely to be of so much use as in many others, since there are many species with scarcely distinguishable covers. There appear, how-

* "The Use of the Opercula in the Determination of the Chilostomatous Bryozoa," Proc. Manchester Lit. & Phil. Soc. vol. xviii. p. 8; "On the Use of the Avicularian Mandible," &c., Journ. Microscopical Soc. ser. 2, vol. v. p. 774.

ever, to be three types, namely:—those nearly round, as *C. Buskii* (*fusca* and *sacculata*), *C. pusilla*, *C. delicatula*, *C. cornuta*, *C. elegans*, *C. perforata*, *C. formosa*, *C. crystallina*, *C. Hannafordii*, *C. insignis*, *C. umbonata*, *C. taurina*; this includes the *vittatæ* of Busk, many having the ovicells central, but this is not universal, *C. cornuta*, *C. perforata*, and *C. taurina* having them terminal or geminate. The second type, including *C. amphora*, *C. ventricosa*, *C. intermedia*, *C. lorica*, *C. hastata*, *C. alata*, *C. carinata*, *C. Wilsoni*, *C. pulchella*, *C. urnula*, and *C. margaritacea*, has the operculum straight below or concave, and corresponds nearly with Mr. Busk's fenestrate group, having the ovicells usually terminal; but this is not the case in *C. carinata*. The next type has a triangular operculum, and perhaps should again be divided into (*a*) the small species, *C. aurita*, *C. geminata* (see fig. 22), and fossil *C. lævigata*, Waters, and *C. longicollis*, W., with a sinus in the aperture, for which MacGillivray has proposed the genus *Claviporella*; this leaves (*b*) the large ones, *C. ponderosa*, *C. ornata* (see fig. 21), *C. solida*, W., and perhaps these should be called *Calpidium*.

It has seemed to me that the terminology in general use was not sufficient for describing the *Catenicellæ*, and therefore when dealing with the fossils, where we have only individual beads or internodes to examine, I suggested ("Chilost. Bry. from Muddy Creek &c.," Quart. Journ. Geol. Soc. vol. xxxix. p. 428) that we should call each bead a "globulus," again distinguishing those with two zoœcia as "biglobuli." In *C. ornata* there are more than two zoœcia, and this is also the case in an interesting fossil from Curdie's Creek, where the internode or multiglobulus has several zoœcia arranged in a bicellate series (Quart. Journ. Geol. Soc. vol. xxxvii. p. 318, pl. xvi. figs. 78, 79).

I also (Quart. Journ. Geol. Soc. vol. xxxix. p. 428) suggested that in the fenestrate division we should distinguish the compartments surrounding the zoœcium as "supra-avicularian," "avicularian," "infra-avicularian," and "pedal." These are most typically represented in *C. alata*; whereas in the first type (namely those with rounded apertures) some of the compartments, even when distinguishable, are very rudimentary.

The mandibles, again, are not of much use, as they are very similar in most of the species examined. In all these there is a comparatively large part in the centre consisting of only one layer and nearly transparent; and as the position of this part varies in the mandibles of many of the Bryozoa and is

valuable for diagnostic purposes, I propose to designate it the "lucida."

There is another character which seems to have had no attention; that is the method of rooting or attachment. In some, as *C. cacatua*, *C. delicatula*, *C. alata*, *C. carinata*, *C. pusilla*, *C. pulchella*, an isolated chitinous tube starts from the back of some of the globuli, and is attached by a spreading grapnel to any substance near; in others, as *C. crystallina*, *C. formosa*, *C. cribraria*, *C. taurina*, *C. cornuta*, *C. perforata*, *C. Hannafordi*, *C. elegans*, *C. insignis*, *C. ventricosa*, *C. hastata*?, *C. lorica*, tubes arise on either the dorsal or front surface, sometimes on both, and several such radicles may start from the same zoœcium. These unite and form solid bundles, becoming thicker towards the base. So far as my collection enables me to judge these are from the dorsal surface in *C. Hannafordi*, *C. margaritacea*, *C. ventricosa*, *C. hastata*?, *C. lorica*, *C. formosa*, *C. cribraria*, *C. cornuta*, *C. perforata*, and from the front in *C. elegans*; in *C. umbonata* mostly from the front, but also from the dorsal surface; in *C. delicatula*, *C. insignis*, *C. taurina* from the back or front. How far these growths are influenced by local conditions can only be examined by those on the spot.

Rooting and articulation seem to be correlated growths—that is, chitinous tubes may be given off to attach the colony to foreign substances or to attach one internode or one part to another, thus allowing motion without destroying the connexion between various sections of the colony. In the same way the radicle-growths of *Idmonea interjuncta* are very similar to the cross bars forming the network, whereas in *I. Milneana* both are stouter; and this will be referred to when dealing with the Cyclostomata.

I was surprised to find that no description of these radicles is given in a large number of species where they occur, and also came upon some interesting cases of articulation which had been overlooked, for instance, in *Caberea lata*, from Holborn Island; I have a specimen in which where the branches divide there are two chitinous tubes, which join in a quasi-ganglionic knot, from which a tube is given off to each branch (see fig. 4).

In thinking this all over it seemed somewhat curious that such a form as *Membranipora roborata* should show no indications of articulation, and in consequence I reexamined my mounted specimens to see how far this was the case, and was not surprised to find that in the unilaminate form where a dichotomization had taken place, and where the zoarium is

readily broken, there were in the interior several chitinous tubes passing from the upper to the lower zoœcia.

There is rooting without articulation in typical *Bugula* and *Flustra*, but these genera have both very little calcareous matter; on the other hand, we see articulation in *Bicellaria*, which is considered sufficiently allied to *Bugula* to be placed in the same family.

In *Catenicella* and other genera a raised disk is formed, out of which the radicle-tube grows, and the connexion with the interior seems to be by means of a rosette-plate at the base of the disk. *Diachoris* has similar roots, and the question may arise as to how far the connecting tubes are to be compared with articulation. I have considered them analogous with the tubes in which the rosette-plates occur in incrusting and erect species; and this view I think is the most probable. *Membranipora radicifera* is rooted with distinct chitinous tubes, on which account MacGillivray has gone so far as to propose its being placed with *Beania*; but this, I think, will scarcely be accepted. What I called *Diachoris patellaria*, Moll, is attached by means of a row of integumentary tubes; nevertheless MacGillivray places it under *Amphiblestrum*. Probably both these cases are only modifications of the mode of attachment which obtains in many incrusting forms, to which I shall have to refer later on.

This first paper happens to deal with articulated species; but this is a character which cannot be considered of primary importance, seeing that it includes a large number of purely Membraniporidan type; others of Microporidan, as *M. ratoniensis*; Microporellidan, as *Adeona* &c.; Poridan, as *Tubucellaria*; or Cellaridan, in a species which, as pointed out, is known unarticulated both living and from the Cretaceous formation. The classificatory value of articulation may, however, not always be the same, as there may be cases where articulation has taken place at a time far removed from the present, and from these parents further differentiation has obtained, forming various articulated groups; in other cases local circumstances may have recently caused articulation without any other character having changed. The mode of articulation seems to be of specific value, but within the same generic group is often very various.

1. *Eucratea chelata* (L.).

Cosmopolitan. Off Shark Island, 8 fath.

2. *Catenicella alata*, W. Thomson. (Pl. IV. fig. 9.)

Catenicella alata, W. Thoms., "On new Genera and Species of Polyzoa," Zool. Bot. Assoc. Dublin, 1859, vol. i. p. 80, pl. vi. fig. 4; MacGillivray, Zool. Vict. dec. iii. p. 21, pl. xxiv. fig. 7; Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 317, pl. xvi. figs. 47, 49, 58, vol. xxxvii. p. 200, vol. xxxix. p. 428, pl. xii. figs. 15, 16.

The opercula are straight below, having a second layer in the upper part, which is often divided down the centre.

Miss Jelly submitted to me a closely allied *Catenicella* from Port Phillip, which, from the general characters and arrangements of the compartments, I at once pronounced to be a variety of *alata*; but every cell is geminate, with one fresh globulus growing from the centre of one of the zoœcia of the previous globulus, first from the right, then from the left, and so on. Between the two zoœcia in the centre of the globulus there is a small avicularium, and this is also the case in the geminate cells of typical *C. alata*, but is not a common character in the *Catenicellæ*.

I mention this variety at some length, as we have the same minute characters with two different modes of increase, and I consider that this gives support to the view expressed that the genus *Catenicellopsis* should be dropped. Since the above was written, MacGillivray has called this *C. gemella*, and therefore it should stand as *C. alata*, var. *gemella*.

Loc. Recent: Bass's Straits, Port Fairy (*Dawson*); Queenscliff; Tasmania; New Zealand; La Pérouse, New South Wales. Fossil: Mount Gambier; Muddy Creek; Bird Rock; and Waurn Ponds (*W.*).

3. *Catenicella ventricosa*, Busk. (Pl. IV. fig. 13.)

Catenicella ventricosa, Busk, Cat. Mar. Polyz. p. 7, pl. ii. figs. 1, 2, pl. iii. figs. 1-5; MacGillivray, Zool. Vict. dec. iii. p. 18, pl. xxiv. fig. 3; Waters, Quart. Journ. Geol. Soc. vol. xxxix. p. 431.

Specimens from La Pérouse have chitinous radicle-tubes from the front and dorsal surface, and these ultimately form very solid bundles. In one case, where there has evidently been an accident, tubes connect the neighbouring cells, thus saving the colony from injury.

Loc. Bass's Straits; Victoria; Tasmania; Port Fairy; New Zealand (*Hutton*); La Pérouse, Botany Bay. Fossil: Bird Rock (Victoria).

4. *Catenicella hastata*, B. (Pl. IV. fig. 10.)

Loc. Bass's Straits; Victoria; New Zealand; La Pérouse,

Botany Bay. Fossil: Bird Rock, and Waurn Ponds (Victoria).

5. *Catenicella Buskii*, W. Thoms. (Pl. IV. fig. 12.)

Catenicella Buskii, Thomson, "On new Genera and Species of Polyzoa," Zool. Bot. Assoc. Dublin, vol. i. 1859, p. 83, pl. viii. fig. 2; MacG. Zool. Vict. dec. iii. p. 24, pl. xxiv. fig. 12.
Catenicella fusca, MacG. *loc. cit.* dec. ix. p. 33, pl. xc. fig. 1.

This is closely allied to *C. gibbosa*, and should perhaps only be considered a variety. The relationship to *elegans* is evident, but how close is somewhat uncertain, as Busk says of *elegans* "ovicell geminate," whereas MacGillivray says ovicell like that of *Buskii*.

Operculum 0·02 millim. wide.

Loc. Western Australia; Bass's Straits; Queenscliff; La Pérouse, Botany Bay, washed on shore.

6. *Catenicella delicatula* (Wilson). (Pl. IV. fig. 11.)

Catenicellopsis delicatula, J. B. Wilson, "On a new Genus of Polyzoa," Micr. Soc. Victoria, vol. i. no. 2, p. 65, pl. iv. fig. 2; MacGillivray, Zool. Vict. dec. xi. p. 30, pl. cvii. fig. 2.

I cannot see that this should be separated from *Catenicella* merely on account of the branches sometimes originating from the sides of the cells. In a specimen from Queenscliff the increase is usually by means of geminate globuli; but there are many which spring out of the side of others and are attached by a chitinous tube. I have a specimen of *C. Hannafordi* in which a new branch starts from the front of a globulus in a similar way; and we also see the same mode of increase in *Menipea crystallina*, *Didymia simplex*, &c., and this should make us hesitate before adopting a new genus. And as supporting this and showing that *Catenicellopsis* should not be separated on account of its mode of growth, I may mention that in my specimens of *C. pusilla* the zoœcia do not spring laterally from the others.

In the small specimens from La Pérouse none of the globuli originate laterally from the others. There are numerous chitinous tubes starting either from the back or the front and united into bundles which become more massive near the base; besides these there are isolated ones springing from the dorsal surface and ending in grappling-hooks.

Operculum nearly round, with muscular attachments at each side, placed about one third of the distance between the proximal and distal edges.

Loc. Living: Spring Creek; Port Phillip Heads; Sor-

rento; Queenscliff; and La Pérouse, Botany Bay, washed on shore.

7. *Cellularia cuspidata*, Busk.

Cellularia cuspidata, Busk, Cat. Mar. Polyzoa, p. 19, pl. xxvii. figs. 1, 2; 'Challenger' Report, p. 17; MacGillivray, Zool. Vict. dec. vi. p. 31, pl. lviii. fig. 1; Haswell, Polyzoa from Queensland, p. 36.

On the dorsal surface there is often a single "perforation," and in a few cases two; but at the position of this perforation there is a muscular attachment for the operculum.

The new branches spring by means of a chitinous tubular connexion from the central cell, and the two side zoœcia are continuous, though rather modified in shape, being thin at the line of junction of the internodes, and with the movement of the new internode seem readily broken. The articulation of *C. Peachii* is by two chitinous tubes to each new branch, one from the central cell and one from each lateral one.

In *C. cuspidata* above the outer angle of the modified cell in each new branch a concave disk is formed, and from this a long chitinous radicle-tube is thrown out. In a few cases there is a radicle thrown out above the outer angle of other cells; but this is not usual. These tubes have not been mentioned by Busk or MacGillivray.

Loc. Australian and New-Zealand seas generally; Shark Island, New South Wales, 8 fathoms.

8. *Menipea crystallina*, Gray.

Loc. Bass's Straits; Queenscliff; Bondi Bay (New South Wales); Tasmania; Straits of Magellan; Campbell Island; New Zealand; La Pérouse, Botany Bay.

9. *Menipea cervicornis*, MacG., var.
(Pl. IV. fig. 1.)

Type *Menipea cervicornis*, MacG. Zool. Vict. dec. vi. p. 34, pl. lviii. fig. 4.

The specimens from Shark Island are without lateral avicularia, but have a small median one on the tricellate internodes at a bifurcation. The internodes are much more elongate than in the typical *M. cervicornis*.

10. *Scrupocellaria scrupea*, Busk.

A specimen from Shoalhaven beach has zoœcia similar in shape to those of the European seas, and the spines, fornix,

avicularia, and vibracula also agree; but, on the other hand, the internodes are short, with usually only three pairs of zoœcia.

11. *Canda arachnoides*, Lamx. (Pl. IV. fig. 7.)

Canda arachnoides, Busk, Brit. Mus. Cat. p. 26, pl. xxxiii.; 'Challenger' Rep. p. 25.

A specimen from La Pérouse has few avicularia, and in large pieces of *C. arachnoides* I have noticed that some parts will be found without avicularia, while in other parts they are abundant.

The increase at the dichotomization, which must often have been examined, does not seem to have been described. Between the two rows of zoœcia an additional one is formed, and from this two chitinous tubes are given off which are curved forwards to the inner zoœcium of a new branch. The other zoœcia are formed direct from the ordinary zoœcia. This seems to be the way in which growth takes place in most of this group, as already seen in *Cellularia cuspidata*, where in the same way the new branches spring by means of a chitinous connexion from the central cell, and the two side cells are continuous, though rather modified in shape; and here, as in some other cases, the articulation does not exist at first, or only partially so, and there is calcareous continuity until the movement of the water causes a fracture at the joint. I have pointed out (Quart. Journ. Geol. Soc. vol. xxxvii. p. 320) that the calcareous wall of *Cellaria* is at first continuous, but is in the same way fractured as growth progresses, some species retaining the continuity longer than others, so that perhaps this may be of specific value.

The oral aperture occurs in a round opening at the lower part of the apparent aperture, and on this account I think there is ground for separating *Canda* from *Caberea*, which has a distinct operculum * closing a rigid oral aperture. This never seems to have been fully figured, although of great importance, perhaps sufficient to separate it from the family Cellularidæ.

Loc. Bass's Straits; Timor; New Zealand (*B.*); Tasmania; Geelong; Port Phillip Heads; La Pérouse.

12. *Caberea Boryi* (Aud.).

Crisia Boryi, Aud. Voyage dans l'Egypte, pl. xii. fig. 4.

* "On the Use of the Avicularian Mandible," &c., Trans. Micros. Soc. ser. 2, vol. v. pl. xiv. fig. 15.

Caberea Boryi, Busk, Brit. Mus. Cat. p. 38, pl. xvi. figs. 4, 5; Hincks, Brit. Mar. Polyzoa, p. 61, pl. viii. figs. 9–11; Waters, "On the Use of the Avicularian Mandible," Journ. Micr. Soc. ser. 2, vol. v. p. 774, pl. xiv. figs. 9, 10, 15.

I am inclined to think that the calcareous border below the operculum should be considered of generic importance, and that this is the only known representative of the genus. This character, with the operculum placed diagonally, seems to have been often overlooked, but was correctly figured by Audouin (see his fig. 4). Mr. Hincks's figure looks as though it was the opening to the ovicell, and in his description no allusion is made to it.

Loc. British; Mediterranean; New Zealand; Bondi Bay and Adelaide. Fossil: Pliocene of Calabria (*Seguenza*).

13. *Caberea grandis*, Hincks.

Caberea grandis, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 50, pl. iii. fig. 4; Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 261.
Caberea rudis, Waters, ibid. vol. xxxvii. p. 322, pl. xviii. fig. 86.

Loc. Curtis Island; Port Phillip Heads; Darnley Island, Torres Straits, sievings from 10–30 fath. Fossil: Curdies Creek (S.W. Victoria); Bairnsdale; Mount Gambier.

14. *Caberea rostrata*, Busk.

Caberea rostrata, Busk, 'Challenger' Rep. p. 28, pl. xxxii. fig. 4.

There is a small piece from La Pérouse. A form like this with a large area, covered with an integument in which is an operculum of the Membraniporidan type, seems to differ considerably from *C. Boryi*, in which the entire chitinous operculum is surrounded by a calcareous border and is entirely above the fornix, and would seem more closely allied to *Scrupocellaria* than to *C. Boryi* and *C. Lyalli*, Busk. I have *C. Boryi* from Bondi Bay and Adelaide.

Loc. New Zealand; La Pérouse.

15. *Didymia simplex*, Busk. (Pl. IV. fig. 20.)

Didymia simplex, Busk, Voyage of the 'Rattlesnake,' p. 383, t. i. fig. 6; Cat. Mar. Polyz. p. 35, pl. xxxix.; 'Challenger' Report, p. 47; MacGillivray, Zool. Vict. dec. v. p. 34, pl. xlvi. fig. 6.

In a few cases fresh branches arise from the front of the zoarium, usually growing from the front of the pair of zoœcia below the pair where bifurcation takes place. This new branch consists at first of only one zoœcium, but the next globulus is bicellate. Chitinous radicle-tubes grow from the dorsal surface of the lower zoœcia.

Busk says ('Challenger' Report, p. 47) that he "could not find any rosette-plates between the zoœcia placed side by side;" but there are two elongate elliptical ones in the median line of the lateral wall near each end.

Loc. Bass's Straits; Queenscliff; Portland (Victoria); Station 163 A. Off Twofold Bay; Tasmania; Shark Island, 8 fath. (New South Wales).

16. *Dimetopia spicata*, Busk.

Loc. Bass's Straits; Queenscliff; Cape Otway; Portland; La Pérouse; New Zealand.

17. *Bugula neritina* (L.). (Pl. IV. figs. 3 and 15.)

For synonyms see Busk, Report of 'Challenger,' p. 42, and add *Acamarchis neritina*, Aud., Savigny's 'Egypte,' p. 69, pl. xi. fig. 1.

Bugula neritina has always been described as without avicularia; but a common form from Ball's Head, Port Jackson, has them in abundance situated at the base of the zoœcia. The beak of the avicularium is prominent and the mandible is large. The mandible is longer than that of *dentata*, but the beak is narrower, and, as in *B. dentata* and *B. avicularis*, there are two small muscular prominences on the proximal chitinous ridge. The shape of the mandibles of *B. dentata*, *B. flabellata*, *B. turbinata*, *B. avicularis*, and *B. plumosa* is almost identical, and they vary in size in the order given.

On the other hand *Bugula Murrayana* has a very long and narrow mandible with the lateral processes curved downwards, whereas the others have a straight lower edge. These "articular processes" are very marked in all the *Bugulæ*, and occur also in *Membranipora*, *Cribrilina*, and *Microporella*, showing that Mr. Busk attached too much importance to them when he to a large extent based the family Adeoneæ on this character.

Mr. Hincks informs me that specimens from Zanzibar and the Arabian Sea marked *B. neritina* have avicularia, and I was told in the British Museum that an Asiatic specimen also had avicularia; but I am not sure whether the observations have been confirmed. Specimens from Shark Island, 8 fath., have no avicularia.

18. *Bugula dentata* (Lamx.). (Pl. IV. fig. 14.)

Loc. Australia; New Zealand; Tasmania; South Africa; Ball's Head, Port Jackson, 12 fath.

19. *Cellaria gracilis* (Busk). (Pl. IV. fig. 6.)

Salicornaria gracilis, Busk, Brit. Mus. Cat. p. 17, pl. lxiii. fig. 3; 'Challenger' Report, p. 93.
Cellaria gracilis, MacGillivray, Zool. Vict. dec. v. p. 50, pl. xlix. fig. 4.

Some fragments from Raton are without avicularia, and then it is difficult to distinguish between *C. Johnsoni*, B., and *C. gracilis*, B.; but the large semicircular opening of the ovicell, often with a very distinct lip, agrees with specimens from Holborn Island, and, I think, enables it to be separated from *C. Johnsoni*, B., with certainty, as this last has smaller elliptical openings. There are Cretaceous fossils from Maestricht &c. which, in the zoœcial characters, are allied to *Cellaria*, although they were erect and unarticulated. The solid branching *Escharella argus*, d'Orb., has an aperture of the Cellarian shape, with four teeth, just like *Cellaria crassa*, and the ovicell is also concealed in a similar manner. Reference to *Escharipora rhomboidalis*, d'Orb., will also show the relationship. I have previously pointed out that the young branches of *Cellaria* at first have the calcareous wall continuous with the parent joint, and the chitinous articulation is formed subsequently; but as some correspondents were unable to verify this, I can only suppose through lack of suitable material, I give a figure taken from a photograph.

This can, however, readily be seen in *C. fistulosa* and any of the common species.

I have pointed out (p. 89) that this is by no means confined to *Cellaria*, but occurs in other articulated species, and supports the idea that articulated forms are derived from unarticulated ones.

In the Crag and other Pliocene formations of Europe *C. crassa* is found with the branches continuous, or, as Mr. Busk says, with a tendency to ossification, which does not seem a fortunate method of indicating what takes place, as we must not suppose that there has ever been a joint.

Loc. Cumberland Island; Cape Capricorn; Victoria; Station 186, 8 fath. (Torres Straits); Holborn Island; off Raton, New Guinea, 7 fath.

20. *Farcimia oculata* (Busk).

Nellia oculata, Busk, Cat. Mar. Polyzoa, p. 18, pl. lxiv. fig. 6, pl. lxv. (*bis*) fig. 4; 'Challenger' Report, p. 27; Smitt, Floridan Bryozoa, p. 3, pl. i. figs. 53, 54; Haswell, Polyzoa from Queensland, p. 36; MacGillivray, Zool. Vict. dec. v. p. 51, pl. xlix. fig. 5; Hincks, Journ. Linn. Soc., Zool. vol. xxi. p. 121.

This was placed at first by Busk in the family Cellariidæ;

but in the 'Challenger' Report he places it under Cellulariadæ, although in the definition of the family he says "zœcia—all facing the same way." Mr. Hincks, in his Brit. Mar. Polyzoa, p. 35, seems inclined to place it under the Cellulariadæ; but his *Farcimia appendiculata*, which is no doubt closely allied, he places under Cellariidæ. The characters are so decidedly Membraniporidan that I called a variety *M. oculata*, var. *spinosa* (Quart. Journ. Geol. Soc. vol. xxxix. p. 434, pl. xii. fig. 22), and I now reluctantly remove it, but do so as it ought to be classified with *F. appendiculata*, H.; *F. cereus*, Pourt.; *F. lusoria*, Waters.

Loc. Torres Straits; Bass's Straits; Florida; Victoria; Cape Grenville, North-east Australia, 20 fath. (*W.*); Piper Islands, 9 fath. (*W.*); 'Challenger' Stations 190, 188, 208, 148, 151, 18–550 fath., being from Heard Island, Crozet Island, the Philippine Islands, and off Bahia; Mergui Archipelago (*H.*); Ceylon (*H.*).

21. *Flustra dissimilis* (Busk).

Carbasea dissimilis, Busk, Cat. Mar. Polyz. p. 51, pl. l. figs. 4–7; MacGillivray, Zool. Vict. dec. v. p. 28, pl. xlv. fig. 3.

Loc. Tasmania (*B.*); Queenscliff; King's Island; Port Phillip Heads (Victoria); Shoalhaven Beach (New South Wales).

22. *Flustra cribriformis* (Busk).

Carbasea cribriformis, Busk, Brit. Mus. Cat. p. 51, pl. lxviii. fig. 1; 'Challenger' Report, p. 58, pl. xxxiv. fig. 8; Haswell, "On some Polyzoa from the Queensland Coast," Proc. Linn. Soc. N. S. Wales, vol. v. p. 37.

A fine specimen from Darnley Island has no radicle-tube at the lower angle of each fenestra, nor is there any indication of such a structure; and as Mr. Busk mentions this in his 'Challenger' specimens, we must conclude that, according to the conditions under which it grows, it is with or without attachment.

On the dorsal surface the central part of each zœcium is thin and the remainder is covered with wavy lines of growth.

Loc. Cumberland Island; Station 186, Cape York, 8 fath.; Station 188, 28 fath.; Station 190, 45 fath.; Holborn Island (*H.*); Darnley Island, Torres Straits, 30 fath.

23. *Flustra militaris*, sp. nov. (Pl. IV. fig. 2.)

Zoarium bilaminate, fronds long and rather narrow, with about eight zœcia in a transverse row. Ovicell large, raised,

with a median rib, and on each side of this an irregular area. On each side below the ovicell two thick club-shaped spines.

The ovicell is composed of two calcareous layers, the under one smooth, so that when the upper one is removed no trace of the area is shown. The structure of the ovicell in *Flustra episcopalis* is just the same, and no doubt the two species are allied; but in *F. episcopalis*, B., the operculum is entire, whereas in the present species it is of the Membraniporidan type. There is a thick tubular growth down the side of the zoarium of *episcopalis*.

On account of the prominent spines I call this *militaris*, in opposition to the less-armed *F. episcopalis*.

Mr. Hincks defines *Flustra* as with the ovicells immersed; but in the two species considered they are much raised.

Loc. Port Jackson (New South Wales).

24. *Diachoris spinigera*, MacG.

Diachoris spinigera, MacGillivray, Trans. Roy. Soc. Vict. 1859, vol. iii. p. 165, pl. ii. fig. 12; Zool. Vict. dec. v. p. 32, pl. xlvi. fig. 3.

The specimen from Shoalhaven Bay has the zoœcia suberect; the spines are mostly towards the distal end, often only two or three on each side; on one side only an avicularium with a prominent beak. There is considerable irregularity in the number of spines, and from this specimen I consider that *D. distans*, Hincks, is too closely allied to be separated as a species.

Loc. Wilson's Promontory; Portland (Victoria); Shoalhaven Bay, 8 fath. (New South Wales).

EXPLANATION OF PLATE IV.

Fig. 1. *Menipea cervicornis*, MacG., var., × 25.
Fig. 2. *Flustra militaris*, sp. nov., × 16.
Fig. 3. *Bugula neritina* (L.), with avicularia. From Ball's Head. × 16.
Fig. 4. Sketch of *Caberea lata* (p. 84), showing chitinous tubes at the junction, × 12.
Fig. 5. *Micropora ratoniensis*, sp. nov., × 16.
Fig. 6. *Cellaria gracilis* (B.), showing continuous calcareous wall before the articulation is formed. The chitinous tubes are just commencing. × 25. From Holborn Island.
Fig. 7. Sketch of *Canda arachnoides*, Lamx., showing chitinous tubes at the articulation. × 25.
Fig. 8. *Membranipora Savartii*, Aud.?, × 16. From Darnley Island.
Fig. 9. Operculum of *Catenicella alata*, W. Thoms., × 85.
Fig. 10. Operculum of *Catenicella hastata*, B., × 85.
Fig. 11. Operculum of *Catenicella delicatula* (Wilson), × 85.
Fig. 12. Operculum of *Catenicella Buskii*, W. Thoms., × 85.
Fig. 13. Operculum of *Catenicella ventricosa*, B., × 85.

Fig. 14. Mandible of *Bugula dentata* (Lamx.), × 85.
Fig. 15. Mandible of *Bugula neritina* (L.), × 85.
Fig. 16. Mandible of *Bugula Murrayana*, Johnst., × 85.
Fig. 17. Mandible of *Bugula capense*, × 85.
Fig. 18. Mandible of *Catenicella geminata*, Th., × 250.
Fig. 19. The same, × 85.
Fig. 20. Lateral wall of *Didymia simplex*, B., showing rosette-plates.
Fig. 21. Operculum of *Calpidium ornatum*, B., × 85.
Fig. 22. Operculum of *Catenicella geminata*, Th., × 85.
Fig. 23. Operculum of *Porina* (?) *inversa*, sp. nov., × 250.
Fig. 24. Mandible of *Lunulites cancellatus*, B., × 250.

VIII.—*On new Reptiles and Batrachians from North Borneo.*

By G. A. Boulenger.

A small collection of Reptiles and Batrachians formed by Mr. John Whitehead on Mount Kina Baloo consists of ten species, four of which are new and described below. The known species are the following:—*Lygosoma variegatum*, Ptrs.; *Lygosoma olivaceum*, Gray; *Tropidonotus sarawacensis*, Gthr.; *Rhacophorus maculatus*, Gray; *Bufo leptopus*, Gthr.; and *Leptobrachium gracile*, Gthr.

Draco obscurus.

Head small; snout as long as the diameter of the orbit; nostril directed upwards, perfectly vertical; tympanum naked, smaller than the eye-opening; eleven upper labials. The male's gular appendage as long as the head, covered with large scales. No nuchal fold or crest. Dorsal scales smooth, equal, not larger than ventrals; a lateral series of widely-distant, enlarged, keeled scales. The fore limb stretched forward extends considerably beyond the tip of the snout; the hind limb reaches the shoulder. Brown above, with black spots on the nape; wing-membranes blackish above, colourless inferiorly; throat brown, with light spots; gular appendage brown, black at the base; lower surface of lateral wattles dark purple.

	millim.
Total length	256
Head	17
Width of head	11
Body	75
Fore limb	42
Hind limb	52
Tail	164

A single male specimen.